U.S. DEPARTMENT OF COMMERCE
National Technical Information Service

PB-253 081

SMITH MOUNTAIN RESERVOIR, BEDFORD, FRANKLIN, AND PITTSYLVANIA COUNTIES, VIRGINIA

PACIFIC NORTHWEST ENVIRONMENTAL
RESEARCH LABORATORY

PREPARED FOR
NATIONAL ENVIRONMENTAL RESEARCH CENTER

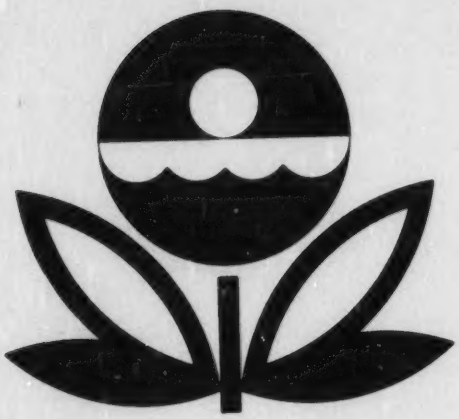
JUNE 1975

153115

PB 253 081

U.S. ENVIRONMENTAL PROTECTION AGENCY
NATIONAL EUTROPHICATION SURVEY

WORKING PAPER SERIES



REPORT
ON
SMITH MOUNTAIN RESERVOIR
BEDFORD, FRANKLIN,
AND
PITTSYLVANIA COUNTIES
VIRGINIA
EPA REGION III
WORKING PAPER No. 465

REPRODUCED BY
NATIONAL TECHNICAL
INFORMATION SERVICE
U. S. DEPARTMENT OF COMMERCE
SPRINGFIELD, VA. 22161

PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LABORATORY

An Associate Laboratory of the

NATIONAL ENVIRONMENTAL RESEARCH CENTER - CORVALLIS, OREGON

and

NATIONAL ENVIRONMENTAL RESEARCH CENTER - LAS VEGAS, NEVADA

☆ GPO—697-032

REPORT
ON
SMITH MOUNTAIN RESERVOIR
BEDFORD, FRANKLIN,
AND
PITTSYLVANIA COUNTIES
VIRGINIA

EPA REGION III

WORKING PAPER No. 465

WITH THE COOPERATION OF THE

VIRGINIA STATE WATER CONTROL BOARD

AND THE

VIRGINIA NATIONAL GUARD

JUNE, 1975

TECHNICAL REPORT DATA
(Please read Instructions on the reverse before completing)

1. REPORT NO.	2.	3. RECIPIENT'S ACCESSION NO.

4. TITLE AND SUBTITLE	5. REPORT DATE
Report on Smith Mountain Reservoir, Bedford, Franklin and Pittsylvania Counties, Virginia	Prepared June 1975
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT NO.
Anonymous (National Eutrophication Survey Staff)	Working Paper # 465
9. PERFORMING ORGANIZATION NAME AND ADDRESS National Eutrophication Survey U.S. Environmental Protection Agency 200 S. W. 35th St. Corvallis, Oregon 97330	10. PROGRAM ELEMENT NO.
	11. CONTRACT/GRANT NO.
12. SPONSORING AGENCY NAME AND ADDRESS Office of Research and Development U.S. Environmental Protection Agency 401 M Street, S. W. Washington, DC 20460	13. TYPE OF REPORT AND PERIOD COVERED Final - 1973
	14. SPONSORING AGENCY CODE

15. SUPPLEMENTARY NOTES
Prepared in cooperation with the U.S. Environmental Protection Agency, National Environmental Research Center, Las Vegas, Nevada 89114

16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
eutrophication lakes nutrients phosphorus nitrogen loading		05B 05C

18. DISTRIBUTION STATEMENT	19. SECURITY CLASS *(This Report)*	21. NO. OF PAGES
Release unlimited		60
	20. SECURITY CLASS *(This page)*	22. PRICE 4.50

EPA Form 2220-1 (9-73)

CONTENTS

	Page
Foreword	ii
List of Virginia Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	10
V. Literature Reviewed	16
VI. Appendices	17

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Virginia State Water Control Board for professional involvement and to the Virginia National Guard for conducting the tributary sampling phase of the Survey.

Eugene T. Jensen, Executive Secretary of the State Water Control Board; Michael A. Bellanca, Director; Jean W. Gregory, Pollution Control Specialist; and Robert W. Pitchford, Pollution Control Technician; Bureau of Surveillance and Field Studies; provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

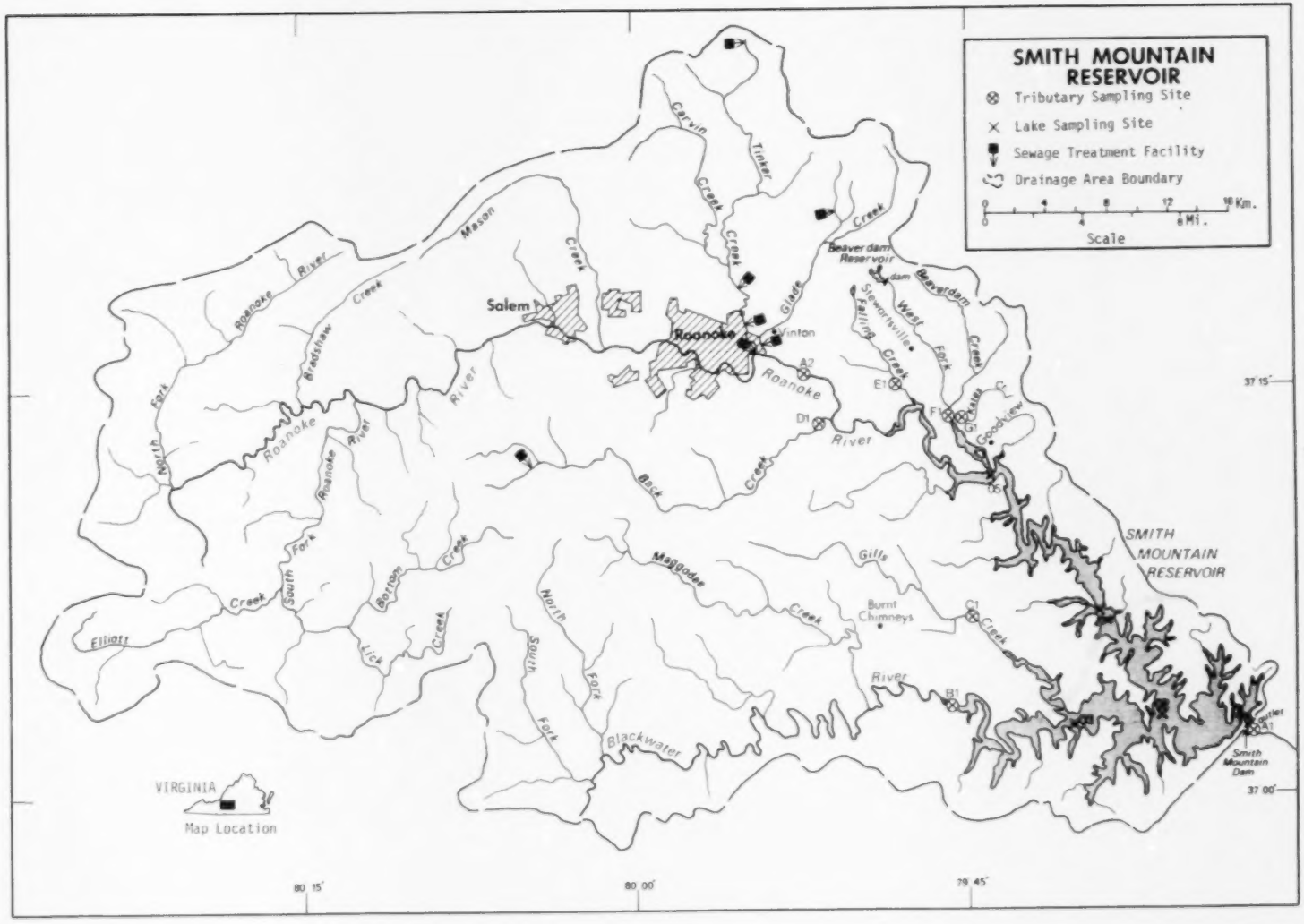
Major General William J. McCaddin, the Adjutant General of Virginia, and Project Officer Lt. Colonel James D. Manley, who directed the volunteer efforts of the Virginia National Guardsmen, also are gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF VIRGINIA

LAKE NAME	COUNTY
Bluestone	Giles, VA; Mercer, Monroe, Summers, WV
Chesdin	Amelia, Chesterfield, Dinwiddie
Chickahominy	Charles City, New Kent
Claytor	Pulaski
J. H. Kerr	Charlotte, Hallifax, Micklenburg, VA; Granville, Vance, Warren, NC
J. W. Flannagan	Dickenson
Occoquan	Fairfax, Prince William
Rivanna	Albemarle
Smith Mountain	Bedford, Franklin, Pittsylvania


SMITH MOUNTAIN RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
Scale
Salem
Roanoke
Vinton
Stewartsville
Beaverdam Reservoir
Smith Mountain Dam
Burnt Chimneys
Cooleewe
Gills
Maggodee
Back
Falling
Glade
Tinker
Carvin
Mason
Bradshaw
Elliott
Boston
Lick
North Fork
South Fork
Blackwater
Roanoke River
Creek
VIRGINIA
Map Location
37 15'
37 00'
80 15'
80 00'
79 45'

SMITH MOUNTAIN RESERVOIR

STORET NO. 5110

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that the Roanoke River Arm of Smith Mountain Reservoir is eutrophic, while the Blackwater River Arm and the main body of the reservoir are mesotrophic. This has also been concluded in previous studies on this water body (Jennings et al., 1970; Simmons and Neff, 1969). Numerous fish kills have been attributed to nutrient and organic enrichment (Ketelle and Uttormark, 1971).

Of the eight Virginia water bodies sampled in 1975, Smith Mountain Reservoir ranked third in overall trophic quality when compared using a combination of six parameters*. Only one water body had less median total and dissolved phosphorus, four had less median inorganic nitrogen and mean chlorophyll a, and only one had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at stations 1, 3, 4, and 5 in July and at all stations in September.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Smith Mountain Reservoir was phosphorus limited at the time the assay sample was collected (04/04/73). The reservoir data indicate phosphorus limitation at the other sampling times as well.

* See Appendix A.

C. Nutrient Controllability:

1. Point sources--The phosphorus load from point sources accounted for 51.3% of the input to Smith Mountain Reservoir during the sampling year. The Roanoke wastewater treatment plant contributed 40.6%, and six other domestic treatment plants and six industrial plants collectively contributed 10.7%. In addition, several small municipal facilities, not included in this report (see page 11), discharge to tributaries of the Roanoke River. The loads from these sources probably would increase the point-source contribution somewhat.

The present phosphorus loading of 2.23 $g/m^2/yr$ is over three times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 15). While even complete removal of phosphorus at the listed point sources would still leave a loading about 1.7 times the eutrophic loading, the reservoir is phosphorus limited, and it is likely that a high degree of phosphorus control at all point sources would at least result in improvement in the presently eutrophic Roanoke River arm and prolong the existing mesotrophic condition of the main body of the reservoir.

2. Non-point sources--The phosphorus load from non-point sources accounted for 48.6% of the total reaching the reservoir during the sampling year. The gaged tributaries contributed a total of 41.3% of the load and ranged from 18.1% (Roanoke River)

to 0.1% (Kates Creek). The ungaged tributaries were estimated to have contributed 6.5% of the total, and the pumped return flow contributed 10.1%.

The mean phosphorus export rates of the Backwater River (35 kg/km^2/year), Gills Creek (41 kg/km^2/year), and Beaverdam Creek (33 kg/km^2/yr) were somewhat higher than the rates of the other tributaries in the drainage basin. This may be indicative of unknown and unsampled point sources or may have been due to land-use practices in those drainages.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 80.94 kilometers^2.
2. Mean depth: 35.1 meters.
3. Maximum depth: >61 meters.
4. Volume: 2,840.994 x 10^6 m^3.
5. Mean hydraulic retention time: 3.2 years.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
Roanoke River	1,326.1	14.0
Blackwater River	463.1	4.9
Gills Creek	82.6	0.9
Back Creek	147.4	1.6
Falling Creek	28.5	0.3
Beaverdam Creek	69.9	0.8
Kates Creek	11.9	0.1
Minor tributaries & immediate drainage -	442.5	5.7
Totals	2,572.0	28.3

2. Outlet -

Roanoke River	2,652.9**	28.3

C. Precipitation***:

1. Year of sampling: 111.4 centimeters.
2. Mean annual: 107.4 centimeters.

† Table of metric conversions--Appendix B.
†† Bellanca, 1975.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Smith Mountain Reservoir was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from five stations on the reservoir and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phtyoplankton identification and enumeration; and during the first visit, an 18.9-liter depth-integrated sample was composited from stations 1, 2, 3, and 4 and another such sample was taken at station 5 for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 61.0 meters at station 1, 35.1 meters at station 2, 29.3 meters at station 3, 37.5 meters at station 4, and 23.2 meters at station 5.

The sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR SMITH MOUNTAIN LAKE
STORET CODE 5110

PARAMETER	1ST SAMPLING (4/ 4/73) 5 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (7/16/73) 5 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (9/26/73) 5 SITES RANGE	MEAN	MEDIAN
TEMP (C)	6.6 - 14.0	9.9	9.8	10.6 - 28.0	20.3	18.1	17.2 - 24.0	20.8	20.1
DISS OXY (MG/L)	4.5 - 13.6	9.9	10.4	0.0 - 9.8	4.7	4.0	0.0 - 7.4	2.0	0.4
CNDCTVY (MCROMO)	75. - 260.	175.	165.	117. - 287.	162.	146.	136. - 313.	164.	146.
PH (STAND UNITS)	7.5 - 8.1	7.8	7.8	6.9 - 9.2	7.8	7.3	6.2 - 8.3	7.0	6.9
TOT ALK (MG/L)	20. - 103.	68.	69.	57. - 136.	78.	70.	54. - 127.	70.	62.
TOT P (MG/L)	0.007 - 0.112	0.028	0.012	0.009 - 0.211	0.029	0.014	0.008 - 0.247	0.034	0.018
ORTHO P (MG/L)	0.002 - 0.062	0.011	0.003	0.002 - 0.025	0.006	0.004	0.004 - 0.018	0.007	0.006
NO2+NO3 (MG/L)	0.320 - 0.830	0.465	0.390	0.050 - 0.790	0.351	0.410	0.030 - 0.380	0.181	0.165
AMMONIA (MG/L)	0.020 - 0.520	0.118	0.050	0.050 - 0.930	0.131	0.080	0.040 - 0.990	0.167	0.070
KJEL N (MG/L)	0.200 - 0.700	0.451	0.400	0.200 - 1.500	0.524	0.400	0.200 - 1.800	0.492	0.400
INORG N (MG/L)	0.340 - 1.320	0.583	0.440	0.120 - 1.080	0.482	0.510	0.110 - 1.030	0.348	0.345
TOTAL N (MG/L)	0.520 - 1.500	0.916	0.810	0.460 - 1.580	0.875	0.810	0.370 - 1.840	0.673	0.585
CHLRPYL A (UG/L)	4.3 - 47.8	18.8	8.2	3.9 - 23.6	10.5	5.7	3.2 - 12.6	5.5	3.7
SECCHI (METERS)	0.8 - 2.3	1.5	1.2	0.9 - 2.7	2.0	2.1	1.8 - 3.6	2.7	2.7

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal Units per ml
04/04/73	1. Stephanodiscus sp.	4,329
	2. Flagellates	2,029
	3. Melosira sp.	433
	4. Ankistrodesmus sp.	352
	5. Synedra sp.	189
	Other genera	163
	Total	7,495
07/16/73	1. Lyngbya sp.	7,994
	2. Chroococcus sp.	2,858
	3. Raphidiopsis sp.	2,501
	4. Flagellates	1,474
	5. Synedra sp.	1,295
	Other genera	2,679
	Total	18,801
09/26/73	1. Flagellates	1,325
	2. Raphidiopsis sp.	564
	3. Merismopedia sp.	536
	4. Dactylococcopsis sp.	479
	5. Stephanodiscus sp.	423
	Other genera	722
	Total	4,049

2. Chlorophyll a -

Sampling Date	Station Number	Chlorophyll a (µg/l)
04/04/73	01	4.3
	02	6.1
	03	27.7
	04	47.8
	05	8.2
07/16/73	01	3.9
	02	5.7
	03	4.5
	04	14.8
	05	23.6
09/26/73	01	3.7
	02	3.2
	03	3.2
	04	4.6
	05	12.6

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. Stations 1, 2, 3, and 4 -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.015	0.505	0.7
0.050 P	0.065	0.505	13.0
0.050 P + 1.0 N	0.065	1.505	16.6
1.0 N	0.015	1.505	0.6

b. Station 5 -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.030	0.940	9.4
0.050 P	0.080	0.940	19.5
0.050 P + 1.0 N	0.080	1.940	26.7
1.0 N	0.030	1.940	10.5

2. Discussion -

The control yield of the assay alga, Selenastrum capricornutum, indicates that the potential primary productivity of Smith Mountain Reservoir was moderate at stations 1-4 but high at station 5. The results also indicate that the reservoir was phosphorus limited at the time the samples were collected (04/04/73). Note that with the addition of nitrogen alone, the yield was not significantly different from the control yield; however, with the addition of only orthophosphorus, a significant increase in yield resulted.

The differences shown by the control yields at stations 1-4 and at station 5 indicate the difference in nutrient availability. Note that the orthophosphorus concentration

at station 5, nearest the domestic effluents, was twice that at stations 1-4.

The reservoir data also indicate phosphorus limitation; i.e., the mean inorganic nitrogen to orthophosphorus ratios were 23 to 1 or greater at all sampling stations and times, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Virginia National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of May and June when two samples were collected. Sampling was begun in July, 1973, and was completed in June, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Virginia District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. The nutrient loads in the pumped return flows from Leesville Reservoir (station AX; see Appendix E) were determined by using the nutrient concentrations measured at station AX and the daily flows measured at station A-1, assuming that Smith Mountain Reservoir was maintained at a constant elevation (Anonymous, 1972). Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations B-1, E-1, F-1, and G-1 and multiplying the means by the ZZ area in km^2.

* See Working Paper No. 175.

The operators of the Roanoke, Roanoke San. Corp. Starter Plant, V'nton, and the Roanoke Nursing Home wastewater treatment plants provided monthly effluent samples and corresponding flow data. The operators of Botetourt Company Interchange San. Corp. and Roanoke Co. P.S.A. North Ardmore Subdivision did not participate in the Survey, and nutrient loads were estimated at 1.134 kg P and 3.401 kg N/capita/year. The operator of the Lord Botetourt High School could not supply flow data, and nutrient loads also were estimated.

In addition to the sources listed below, six small domestic facilities, with a total design flow of 643.4 m^3/day, discharge to tributaries of the Roanoke River (Jennings et al., 1970). Nutrient loads from these sources are included in the tributary loads.

A. Waste Sources:

1. Known municipal* -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Roanoke	150,000	act. sludge	88,258.1	Roanoke River
Vinton	10,000	trickling filter	2,983.8	Tinker Creek
Roanoke San. Corp. Starter Plant, Salem	1,800	stab. pond	1,283.1	Back Creek
Roanoke Nursing Home	140	stab. pond	18.7	Unnamed trib. to Glade Creek
Lord Botetourt High Sch.	143**	trickling filter	54.1†	Unnamed trib. to Tinker Creek
Botetourt Co. Interchange San. Corp.††	690	stab. pond	261.2†	Tinker Creek
Roanoke Co. P.S.A. North Ardmore Subd.	65	stab. pond	24.6†	Tinker Creek

* Gregory, 1973; Anonymous, 1971.
** Estimate based on 800 students, 5 days/week, no summer school.
† Flow estimate based on 0.3785 m^3/capita/day.
†† Anonymous, 1971.

2. Industrial -

Industrial point sources in the upper Roanoke River watershed have an estimated design flow of less than 189.3 m^3/day and include the Koppers Co., Inc.; Eaton Yale & Towne, Inc.; Fuel Oil & Equipment Co.; Norfolk & Western RR Co: Shaffer Crossing and East End Shops; and Roanoke Electric Steel Co. (Jennings et al., op. cit.). These sources were not sampled during the Survey year; however, in their 1971 study, Grizzard and Jennelle (1972) calculated that industrial sources in the watershed contributed 15 kg total P and 91 kg Kjeldahl N per day. Nutrient loads attributed to industrial sources in this report are based on these values.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
Pumped Return Flow	18,195	10.1
Roanoke River	32,735	18.1
Blackwater River	16,080	8.9
Gills Creek	3,415	1.9
Back Creek	960	0.5
Falling Creek	700	0.4
Beaverdam Creek	2,330	1.3
Kates Creek	150	0.1
b. Minor tributaries & immediate drainage (non-point load) -	11,725	6.5
c. Known municipal STP's -		
Roanoke	73,230	40.6
Vinton	8,215	4.6
Roanoke San. Corp. Starter Plant	4,570	2.5
Roanoke Nursing Home	75	<0.1
Lord Botetourt High Sch.	160	0.1
Botetourt Co. Interchange San. Co.	780	0.4
Roanoke Co. P.S.A. North Ardmore Subd.	75	<0.1
d. Septic tanks* -	75	<0.1
e. Industrial -	5,475	3.0
f. Direct precipitation** -	1,415	0.8
Total	180,360	100.0

2. Outputs -

Lake outlet - Roanoke River 9,995

3. Net annual P accumulation - 170,365 kg.

* Estimate based on 256 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
Pumped Return Flow	742,825	32.8
Roanoke River	553,660	24.5
Blackwater River	155,130	6.9
Gills Creek	23,015	1.0
Back Creek	32,265	1.4
Falling Creek	9,250	0.4
Beaverdam Creek	24,565	1.1
Kates Creek	3,130	0.1
b. Minor tributaries & immediate drainage (non-point load) -	140,935	6.2
c. Known municipal STP's -		
Roanoke	429,425	19.0
Vinton	17,030	0.8
Roanoke San. Corp. Starter Plant, Salem	5,075	0.2
Roanoke Nursing Home	185	<0.1
Lord Botetourt High Sch.	485	<0.1
Botetourt Co. Interchange San. Corp.	2,345	0.1
Roanoke Co. P.S.A. North Ardmore Subd.	220	<0.1
d. Septic tanks* -	2,730	0.1
e. Industrial -	33,215**	1.5
f. Direct precipitation*** -	87,385	3.9
Total	2,262,870	100.0

2. Outputs -

Lake outlet - Roanoke River 661,230

3. Net annual N accumulation - 1,601,640 kg.

* Estimate based on 256 lakeshore dwellings; see Working Paper No. 175.
** Kjeldahl N only.
*** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg $P/km^2/yr$	kg $N/km^2/yr$
Roanoke River	25	418
Blackwater River	35	335
Gills Creek	41	279
Back Creek	7	219
Falling Creek	25	325
Beaverdam Creek	33	351
Kates Creek	13	263

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	2.23	2.10	28.0	19.8

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Smith Mountain Reservoir:

"Dangerous" (eutrophic loading)	0.64
"Permissible" (oligotrophic loading)	0.32

V. LITERATURE REVIEWED

Anonymous, 1971. Inventory of municipal waste facilities. EPA Publ. OWP-1, vol. 3, Wash., DC.

Anonymous, 1972. Water resources data for Virginia, 1971. U.S. Geol. Survey, Wash., DC.

Bellanca, M. A., 1975. Personal communication (lake morphometry). VA Water Contr. Bd., Richmond.

Gregory, Jean, 1973. Personal communication (nutrient point sources impacting Smith Mountain Reservoir). VA Water Contr. Bd., Richmond.

Grizzard, Thomas J., and Ernest M. Jennelle, 1972. Will wastewater treatment stop eutrophication of impoundments? Proc. 27th Indust. Waste Conf., Purdue U., Lafayette, IN.

Jennings, Robert R., J. H. Tackett, D. R. Wheeler, C. R. Berry, J. T. Canaday, and E. R. Arnold; 1970. The preliminary investigation of the water quality in the upper Roanoke River watershed. Tech. Serv. Divn., VA Water Contr. Bd., Richmond.

Ketelle, Martha J., and Paul D. Uttormark, 1971. Problem lakes in the United States. EPA Water Poll. Contr. Res. Ser., Proj. #16010 EHR, Wash., DC.

Simmons, G. M., Jr., and S. E. Neff, 1969. The effect of pumped-storage reservoir operation on biological productivity and water quality. Bull. 21, Water Resources Res. Ctr., VA Poly. Inst., Blacksburg.

Vollenweider, R. A., and P. J. Dillon, 1974. The application of the phosphorus loading concept to eutrophication research. Natl. Res. Council of Canada Publ. No. 13690, Canada Centre for Inland Waters, Burlington, Ontario.

VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
5103	CLAYTOR LAKE	0.031	0.450	439.500	5.642	14.900	0.008
5105	JOHN W. FLANNAGAN DAM	0.011	0.320	415.700	5.955	14.800	0.004
5106	JOHN H. KERR RESERVOIR	0.044	0.290	458.937	8.833	15.000	0.009
5108	OCCOQUAN RESERVOIR	0.098	0.525	459.750	12.417	15.000	0.037
5110	SMITH MOUNTAIN LAKE	0.015	0.410	419.667	11.593	15.000	0.005
5111	LAKE CHESDIN	0.044	0.240	465.778	12.556	14.800	0.008
5112	CHICKAHOMINY LAKE	0.066	0.125	455.333	13.600	9.400	0.017
5113	RIVANNA (SOUTH FORK) RES	0.079	0.475	460.222	6.667	13.000	0.022

Reproduced from best available copy.

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500- MEAN SEC	MEAN CHLORA	15- MIN DO	MEDIAN DISS ORTHO P	INDEX NO
5103	CLAYTOR LAKE	71 (5)	29 (2)	71 (5)	100 (7)	43 (3)	64 (4)	378
5105	JOHN W. FLANNAGAN DAM	100 (7)	57 (4)	100 (7)	86 (6)	64 (4)	100 (7)	507
5106	JOHN H. KERR RESERVOIR	43 (3)	71 (5)	43 (3)	57 (4)	14 (0)	43 (3)	271
5108	OCCOQUAN RESERVOIR	0 (0)	0 (0)	29 (2)	29 (2)	14 (0)	0 (0)	72
5110	SMITH MOUNTAIN LAKE	86 (6)	43 (3)	86 (6)	43 (3)	14 (0)	86 (6)	358
5111	LAKE CHESDIN	57 (4)	86 (6)	0 (0)	14 (1)	64 (4)	64 (4)	285
5112	CHICKAHOMINY LAKE	29 (2)	100 (7)	57 (4)	0 (0)	100 (7)	29 (2)	315
5113	RIVANNA (SOUTH FORK) RES	14 (1)	14 (1)	14 (1)	71 (5)	86 (6)	14 (1)	213

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO.
1	5105	JOHN W. FLANNAGAN DAM	507
2	5103	CLAYTOR LAKE	378
3	5110	SMITH MOUNTAIN LAKE	358
4	5112	CHICKAHOMINY LAKE	315
5	5111	LAKE CHESDIN	285
6	5106	JOHN H. KERR RESERVOIR	271
7	5113	RIVANNA (SOUTH FORK) RES	213
8	5108	OCCOQUAN RESERVOIR	72

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR VIRGINIA 02/05/76

LAKE CODE 5110 SMITH MOUNTAIN LAKE

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 2652.9

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
5110A1	2652.9	33.98	39.64	48.14	39.64	31.15	21.24	18.97	22.94	17.27	19.26	19.82	28.32	28.31
5110A2	1326.1	16.42	19.54	23.79	19.54	15.86	10.48	9.34	11.61	8.50	9.63	9.63	14.16	14.02
5110B1	463.6	5.66	7.08	8.50	7.08	5.38	3.68	3.40	3.96	3.11	3.40	3.40	4.81	4.94
5110C1	82.6	1.08	1.36	1.53	1.33	0.93	0.65	0.57	0.68	0.54	0.59	0.74	0.91	0.91
5110D1	147.4	1.90	2.38	2.75	2.32	1.70	1.19	1.02	1.22	0.96	1.08	1.27	1.33	1.59
5110E1	28.5	0.37	0.48	0.54	0.45	0.31	0.23	0.20	0.23	0.20	0.20	0.28	0.31	0.32
5110F1	69.9	0.91	1.16	1.30	1.10	0.79	0.57	0.48	0.57	0.45	0.51	0.62	0.76	0.77
5110G1	11.9	0.17	0.23	0.23	0.20	0.14	0.08	0.08	0.08	0.08	0.08	0.11	0.14	0.14
5110ZZ	523.2	6.80	8.21	9.63	7.93	6.23	4.25	3.68	4.53	3.40	3.68	3.96	5.66	5.65

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 2652.9
SUM OF SUB-DRAINAGE AREAS = 2653.2
TOTAL FLOW IN = 340.59
TOTAL FLOW OUT = 340.37

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5110A1	7	73	25.20	15	5.38				
	8	73	36.81	11	5.80	12	3.96		
	9	73	19.82	14	36.81	15	7.08		
	10	73	14.72	19	6.29	20	3.31		
	11	73	13.03	9	3.74	10	3.40		
	12	73	31.15	14	8.50	15	7.93		
	1	74	27.75	11	45.31	12	36.81		
	2	74	24.07	16	18.12	16	18.69		
	3	74	31.15	15	5.95	16	5.38		
	4	74	52.39	12	6.80	13	6.23		
	5	74	30.30	3	18.69	4	18.12		
	5	74	30.30	17	42.48	18	14.16	31	16.99
	6	74	26.05	1	7.08	14	8.50	15	7.08
5110A2	7	73	14.16	15	15.94				
	8	73	12.46	11	20.56				
	9	73	6.09	15	6.97				
	10	73	7.62	20	4.87				
	11	73	6.51	11	5.52				
	12	73	22.23	15	13.73				
	1	74	33.98	12	29.17				
	2	74	20.81	16	17.02				
	3	74	20.30	16	21.35				
	4	74	22.85	12	19.14				
	5	74	10.79	4	10.48	18	13.34		
	6	74	7.99	1	9.09	15	7.99		

TRIBUTARY FLOW INFORMATION FOR VIRGINIA 02/05/76

LAKE CODE 5110 SMITH MOUNTAIN LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
511081	7	73	4.62	15	3.79				
	8	73	5.47	11	3.40				
	9	73	2.83	15	5.32				
	10	73	4.25	20	2.66				
	11	73	3.62	10	3.40				
	12	73	4.84	15	4.19				
	1	74	11.27	12	8.07				
	2	74	6.65	16	6.09				
	3	74	6.09	16	6.46				
	4	74	7.79	13	5.66				
	5	74	4.47	4	3.96	17	4.39	31	3.96
	6	74	3.82	15	4.25				
5110C1	7	73	0.75	15	0.62				
	8	73	0.88	11	0.57				
	9	73	0.46	15	0.85				
	10	73	0.71	20	0.45				
	11	73	0.59	10	0.57				
	12	73	1.02	15	0.65				
	1	74	2.27	12	2.15				
	2	74	1.25	16	1.13				
	3	74	1.27	16	1.39				
	4	74	1.30	13	1.22				
	5	74	0.99	4	0.68	18	1.13	31	0.59
	6	74	0.44	15	0.42				
5110D1	7	73	3.51	15	1.78				
	8	73	0.71	11	0.71				
	9	73	0.43	15	0.45				
	10	73	0.59	20	0.40				
	11	73	0.49	10	0.42				
	12	73	1.53	15	0.96				
	1	74	3.40	12	3.34				
	2	74	1.87	16	1.67				
	3	74	1.87	16	1.98				
	4	74	1.95	13	1.81				
	5	74	1.10	4	0.96	17	1.73	31	0.85
	6	74	0.68	15	0.65				
5110E1	7	73	0.22	15	0.10				
	8	73	0.08	11	0.08				
	9	73	0.05	15	0.05				
	10	73	0.06	20	0.04				
	11	73	0.05	11	0.04				
	12	73	0.28	15	0.17				
	1	74	0.62	12	0.57				
	2	74	0.34	16	0.31				
	3	74	0.35	16	0.35				
	4	74	0.36	13	0.33				
	5	74	0.20	4	0.19	18	0.25		
	6	74	0.13	1	0.18	15	0.12		

TRIBUTARY FLOW INFORMATION FOR VIRGINIA 02/05/76

LAKE CODE 5110 SMITH MOUNTAIN LAKE

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
5110F1	7	73	1.16	15	0.54				
	8	73	0.43	11	0.40				
	9	73	0.26	15	0.26				
	10	73	0.28	20	0.18				
	11	73	0.24	11	0.21				
	12	73	0.74	15	0.45				
	1	74	1.61	12	1.50				
	2	74	0.88	16	0.76				
	3	74	0.88	16	0.85				
	4	74	0.91	13	0.85				
	5	74	0.54	4	0.45	18	0.62		
	6	74	0.33	1	0.45	15	0.31		
5110G1	7	73	0.25	15	0.12				
	8	73	0.09	11	0.08				
	9	73	0.06	15	0.06				
	10	73	0.06	20	0.04				
	11	73	0.05	11	0.05				
	12	73	0.13	15	0.08				
	1	74	0.28	12	0.26				
	2	74	0.15	16	0.14				
	3	74	0.15	16	0.14				
	4	74	0.16	13	0.14				
	5	74	0.09	4	0.08	18	0.10		
	6	74	0.06	1	0.08	15	0.05		

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 76/02/05

511001
37 02 34.0 079 32 15.0
SMITH MOUNTAIN LAKE
51019 VIRGINIA

11EPALES
3

2111202
0192 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/04	12 30	0000	10.7		84	160	7.90	60	0.040	0.600	0.350	0.003
	12 30	0006	10.7	11.0		160	7.90	59	0.030	0.400	0.330	0.002K
	12 30	0015	10.5	11.0		160	7.90	58	0.030	0.400	0.320	0.002K
	12 30	0025	10.5	11.0		160	7.90	59	0.030	0.400	0.320	0.002K
	12 30	0040	10.1	10.8		160	7.90	67	0.050	0.600	0.370	0.002
	12 30	0065	9.5	10.6		162	7.80	67	0.040	0.400	0.360	0.002
	12 30	0090	9.2	10.4		162	7.80	68	0.050	0.400	0.360	0.003
	12 30	0110	9.0	10.0		162	7.80	67	0.050	0.400	0.360	0.003
	12 30	0130	8.0	9.8		180	7.70	74	0.070	0.400	0.430	0.004
	12 30	0160	7.3	9.4		190	7.70	80	0.090	0.400	0.480	0.003
	12 30	0188	7.2	9.2		200	7.70	81	0.090	0.400	0.520	0.003
73/07/16	09 30	0000	27.0		106	173	8.70	64	0.090	1.100	0.160	0.007
	09 30	0005	26.9	8.2		174	8.70	63	0.080	0.500	0.170	0.005
	09 30	0015	20.5	5.8		142	7.40	59	0.080	0.300	0.350	0.003
	09 30	0025	18.1	5.4		130	7.20	57	0.090	0.300	0.410	0.002
	09 30	0050	16.3	3.6		128	7.10	60	0.070	0.400	0.440	0.002
	09 30	0100	14.0	4.0		134	7.10	61	0.060	0.200	0.500	0.003
	09 30	0150	11.9	2.6		117	7.00	67	0.080	0.300	0.520	0.003
	09 30	0200	10.6	0.2		186	6.90	63	0.160	0.500	0.480	0.005
73/09/26	11 15	0000	22.2		90	150	7.30	60	0.060	0.400	0.150	0.005
	11 15	0005	21.8	5.4		148	7.30	62	0.070	0.200	0.170	0.004
	11 15	0020	21.1	3.8		145	7.10	62	0.100	0.200	0.180	0.004
	11 15	0025	20.7	3.4		144	6.90	61	0.100	0.200	0.190	0.004
	11 15	0055	19.8	1.8		142	6.70	60	0.130	0.400	0.210	0.004
	11 15	0085	19.3	1.4		141	7.00	61	0.140	0.300	0.230	0.004
	11 15	0115	18.7	0.4		136	6.90	61	0.080	0.200	0.330	0.004
	11 15	0145	17.9	0.2		139	6.80	64	0.220	0.300	0.200	0.004
	11 15	0170	17.4	0.2		147	6.90	70	0.380	0.600	0.100	0.004
	11 15	0180	17.2	0.2		149	6.90	75	0.540	0.800	0.040	0.006

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/02/05

511001
37 02 34.0 079 32 15.0
SMITH MOUNTAIN LAKE
51019 VIRGINIA

11EPALES 2111202
3 0192 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/04	12 30	0000	0.009	4.3
	12 30	0006	0.008	
	12 30	0015	0.007	
	12 30	0025	0.007	
	12 30	0040	0.010	
	12 30	0065	0.010	
	12 30	0090	0.009	
	12 30	0110	0.012	
	12 30	0130	0.011	
	12 30	0160	0.012	
	12 30	0188	0.013	
73/07/16	09 30	0000	0.020	3.9
	09 30	0005	0.014	
	09 30	0015	0.015	
	09 30	0025	0.018	
	09 30	0050	0.014	
	09 30	0100	0.009	
	09 30	0150	0.013	
	09 30	0200	0.025	
73/09/26	11 15	0000	0.012	3.7
	11 15	0005	0.014	
	11 15	0020	0.016	
	11 15	0025	0.013	
	11 15	0055	0.014	
	11 15	0085	0.015	
	11 15	0115	0.009	
	11 15	0145	0.015	
	11 15	0170	0.026	
	11 15	0180	0.038	

STORET RETRIEVAL DATE 76/02/05

511002
37 02 38.0 079 35 52.0
SMITH MOUNTAIN LAKE
51019 VIRGINIA

11EPALES 2111202
3 0094 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/04	13	30 0000	11.3		90	168	8.00	57	0.020	0.400	0.330	0.002K
	13	30 0006	11.0			165	8.10	56	0.020	0.300	0.320	0.002K
	13	30 0015	11.0	11.4		165	8.10	54	0.020	0.300	0.320	0.002K
	13	30 0022	11.0	11.5		165	8.10	71	0.030	0.300	0.320	0.002K
	13	30 0030	10.0	11.2		160	8.10	72	0.030	0.200	0.320	0.002K
	13	30 0045	9.8	11.0		160	8.00	69	0.040	0.200	0.330	0.002K
	13	30 0060	8.8	10.7		160	7.90	69	0.050	0.300	0.330	0.002K
	13	30 0075	8.6	10.7		168	7.80	70	0.060	0.300	0.350	0.002
	13	30 0090	8.3	10.4		170	7.80	71	0.070	0.400	0.390	0.002
73/07/16	10	45 0000	26.9		106	170	8.90	65	0.080	0.800	0.150	0.005
	10	45 0005	26.9	8.0		170	8.90	66	0.050	0.500	0.130	0.004
	10	45 0015	26.4	8.6		164	8.50	62	0.050	0.300	0.160	0.004
	10	45 0025	17.8	5.0		134	7.40	67	0.090	0.200	0.410	0.007
	10	45 0040	15.9	4.4		129	7.20	69	0.070	0.400	0.460	0.004
	10	45 0070	14.9	8.8		124	7.20	69	0.080	0.300	0.510	0.004
73/09/26	10	40 0000	23.4		142	157	6.60	65	0.050	0.400	0.110	0.005
	10	40 0005	23.4	7.2		159	7.20	62	0.040	0.300	0.110	0.004
	10	40 0020	23.2	7.0		156	7.40	63	0.040	0.300	0.110	0.005
	10	40 0025	20.8	1.2		141	6.90	59	0.070	0.300	0.280	0.005
	10	40 0050	19.9	0.6		140	6.90	58	0.050	0.200K	0.330	0.005
	10	40 0075	19.4	0.2		138	6.90	58	0.040	0.200	0.380	0.004
	10	40 0100	18.7	0.2		138	6.90	61	0.060	0.200K	0.350	0.011
	10	40 0115	18.3	0.2		141	6.90	62	0.120	0.200	0.260	0.007

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/02/05

511002
37 02 38.0 079 35 52.0
SMITH MOUNTAIN LAKE
51019 VIRGINIA

11EPALES 2111202
3 0094 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/04	13 30	0000	0.010	6.1
	13 30	0006	0.009	
	13 30	0015	0.009	
	13 30	0022	0.009	
	13 30	0030	0.008	
	13 30	0045	0.008	
	13 30	0060	0.008	
	13 30	0075	0.009	
	13 30	0090	0.010	
73/07/16	10 45	0000	0.016	5.7
	10 45	0005	0.011	
	10 45	0015	0.012	
	10 45	0025	0.014	
	10 45	0040	0.011	
	10 45	0070	0.011	
73/09/26	10 40	0000	0.020	3.2
	10 40	0005	0.020	
	10 40	0020	0.019	
	10 40	0025	0.018	
	10 40	0050	0.019	
	10 40	0075	0.008	
	10 40	0100	0.013	
	10 40	0115	0.010	

STORET RETRIEVAL DATE 76/02/05

511003
37 07 10.0 079 39 50.0
SMITH MOUNTAIN LAKE
51067 VIRGINIA

11EPALES
3

2111202
0100 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/04	14 45	0000	12.2		36	78	8.00	20	0.040	0.400	0.410	0.006
	14 45	0006	11.8	11.3		75	7.90	20	0.030	0.300	0.410	0.002
	14 45	0015	11.6	11.0		78	7.90	20	0.030	0.300	0.410	0.002
	14 45	0025	9.8	10.6		85	7.80	25	0.030	0.300	0.380	0.002K
	14 45	0045	8.3	10.6		120	7.70	37	0.040	0.300	0.320	0.002
	14 45	0060	8.0	10.4		130	7.70	50	0.050	0.600	0.330	0.002
	14 45	0075	7.4	9.8		140	7.60	53	0.050	0.400	0.320	0.002K
	14 45	0096	7.2	9.3		148	7.60	56	0.050	0.400	0.330	0.003
73/07/16	11 45	0000	27.0		84	146	8.80	70	0.070	0.500	0.120	0.003
	11 45	0005	27.0	8.0		156	8.70	70	0.060	0.400	0.100	0.002
	11 45	0015	26.8	8.4		146	8.50	66	0.050	0.400	0.110	0.002
	11 45	0025	17.8	6.2		138	7.20	73	0.070	0.400	0.390	0.003
	11 45	0040	15.9	3.6		128	7.10	73	0.100	0.300	0.480	0.005
	11 45	0065	14.7	2.8		123	7.00	74	0.120	0.300	0.500	0.005
73/09/28	10 45	0000	24.0		110	140	7.50	54	0.070	0.900	0.070	0.014
	10 45	0005	23.6	7.4		145	7.10	57	0.040	0.600	0.070	0.011
	10 45	0020	22.4	2.6		147	6.60	59	0.070	0.500	0.200	0.008
	10 45	0040	20.0	0.2		141	6.50	59	0.060	0.500	0.330	0.008
	10 45	0060	19.6	0.2		139	6.20	59	0.070	0.400	0.340	0.008
	10 45	0082	19.1	0.4		140	6.40	60	0.160	0.500	0.150	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/02/05

511003
37 07 10.0 079 39 50.0
SMITH MOUNTAIN LAKE
51067 VIRGINIA

11EPALES 2111202
3 0100 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/04	14 45	0000	0.038	27.7
	14 45	0006	0.028	
	14 45	0015	0.025	
	14 45	0025	0.018	
	14 45	0045	0.012	
	14 45	0060	0.047	
	14 45	0075	0.008	
	14 45	0096	0.007	
73/07/16	11 45	0000	0.014	4.5
	11 45	0005	0.012	
	11 45	0015	0.011	
	11 45	0025	0.015	
	11 45	0040	0.011	
	11 45	0065	0.010	
73/09/28	10 45	0000	0.026	3.2
	10 45	0005	0.016	
	10 45	0020	0.017	
	10 45	0040	0.016	
	10 45	0060	0.013	
	10 45	0082	0.018	

STORET RETRIEVAL DATE 76/02/05

511004
37 02 35.0 079 39 00.0
SMITH MOUNTAIN LAKE
51067 VIRGINIA

11EPALES
3

2111202
0127 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/04	16 40	0000	12.9		48	220		88	0.090	0.700	0.590	0.005
	16 40	0006	12.8	13.6		230		87	0.090	0.600	0.600	0.006
	16 40	0015	12.6	13.3		220		87	0.090	0.700	0.580	0.005
	16 40	0025	11.6	11.1		220		87	0.150	0.600	0.570	0.005
	16 40	0040	9.7	10.0		210		85	0.180	0.400	0.560	0.005
	16 40	0060	9.3	9.8		210		85	0.190	0.400	0.560	0.008
	16 40	0080	7.8	8.1		225		90	0.300	0.600	0.730	0.028
	16 40	0100	7.0	7.6		245		98	0.380	0.600	0.820	0.045
	16 40	0123	6.6	7.0		250		98	0.390	0.600	0.830	0.047
73/07/16	14 30	0000	28.0		60	219	9.10	100	0.120	0.900	0.110	0.010
	14 30	0005	27.8	9.8		217	9.10	97	0.130	0.600	0.080	0.004
	14 30	0015	24.2	4.1		220	7.70	102	0.130	0.600	0.420	0.006
	14 30	0025	17.5	2.8		148	7.20	79	0.110	0.500	0.510	0.004
	14 30	0040	15.3	3.4		132	7.10	77	0.080	0.300	0.530	0.003
	14 30	0065	14.6	3.8		126	7.10	77	0.100	0.200	0.540	0.003
	14 30	0086	13.6	3.2		128	7.10	82	0.060	0.200	0.540	0.004
73/09/26	10 05	0000	23.9		108	203	8.00	85	0.060	0.900	0.070	0.005
	10 05	0005	23.9	7.2		203	7.80	83	0.060	0.500	0.070	0.006
	10 05	0020	22.2	0.2		163	7.10	68	0.070	0.300	0.260	0.007
	10 05	0040	20.1	0.1		139	6.90	61	0.050	0.300	0.360	0.009
	10 05	0060	19.5	0.4		136	6.80	61	0.050	0.300	0.350	0.006
	10 05	0080	19.0	0.2		140	6.70	64	0.090	0.300	0.290	0.007
	10 05	0100	18.3	0.8		158	6.90	73	0.320	0.600	0.100	0.010

STORET RETRIEVAL DATE 76/02/05

511004
37 02 35.0 079 39 00.0
SMITH MOUNTAIN LAKE
51067 VIRGINIA

11EPALES 2111202
3 0127 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/04	16 40	0000	0.053	47.8
	16 40	0006	0.047	
	16 40	0015	0.042	
	16 40	0025	0.027	
	16 40	0040	0.020	
	16 40	0060	0.020	
	16 40	0080	0.031	
	16 40	0100	0.054	
	16 40	0123	0.051	
73/07/16	14 30	0000	0.025	14.8
	14 30	0005	0.021	
	14 30	0015	0.022	
	14 30	0025	0.014	
	14 30	0040	0.013	
	14 30	0065	0.014	
	14 30	0086	0.016	
73/09/26	10 05	0000	0.025	4.6
	10 05	0005	0.022	
	10 05	0020	0.022	
	10 05	0040	0.014	
	10 05	0060	0.015	
	10 05	0080	0.018	
	10 05	0100	0.050	

STORET RETRIEVAL DATE 76/02/05

511005
37 11 31.0 079 43 37.0
SMITH MOUNTAIN LAKE
51019 VIRGINIA

11EPALES
3

2111202
0080 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/04	15	20 0000	14.0		33	195	7.90	70	0.170	0.700	0.570	0.028
	15	20 0004	14.0	9.8		205	7.90	75	0.200	0.600	0.580	0.034
	15	20 0015	12.6	8.4		160	7.80	59	0.230	0.400	0.550	0.031
	15	20 0035	9.7	7.1		240	7.60	93	0.380	0.600	0.720	0.052
	15	20 0055	8.8	4.5		260	7.60	102	0.520	0.700	0.800	0.062
	15	20 0075	7.7	4.6		260	7.50	103	0.490	0.700	0.800	0.060
73/07/16	15	25 0000	27.8		36	230	9.20	102	0.090	1.200	0.070	0.010
	15	25 0005	27.8	8.8		230	9.00	103	0.070	0.800	0.050	0.007
	15	25 0015	24.0	1.5		287	7.50	136	0.290	0.700	0.790	0.009
	15	25 0025	18.7	0.0		188	7.30	105	0.220	0.600	0.730	0.025
	15	25 0050	14.6	0.2		140	7.10	88	0.390	0.800	0.590	0.015
	15	25 0076	13.7	0.6		154	7.10	102	0.930	1.500	0.080	0.012
73/09/26	09	20 0000	23.7		72	240	8.30	96	0.070	0.700	0.060	0.008
	09	20 0005	23.6	7.0		246	8.20	98	0.070	0.500	0.050	0.009
	09	20 0015	23.4	4.6		248	7.50	100	0.160	0.500	0.120	0.011
	09	20 0025	22.3	0.2		313	7.10	127	0.690	1.200	0.160	0.018
	09	20 0040	20.1	0.1		172	7.00	81	0.210	0.500	0.030	0.013
	09	20 0055	19.6	0.0		192	6.80	84	0.700	1.200	0.040	0.009
	09	20 0070	19.3	0.0		204	6.80	91	0.990	1.800	0.040	0.007

STORET RETRIEVAL DATE 76/02/05

511005
37 11 31.0 079 43 37.0
SMITH MOUNTAIN LAKE
51019 VIRGINIA

11EPALES 2111202
3 0080 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/04	15 20	0000	0.076	8.2
	15 20	0004	0.062	
	15 20	0015	0.057	
	15 20	0035	0.071	
	15 20	0055	0.105	
	15 20	0075	0.112	
73/07/16	15 25	0000	0.059	23.6
	15 25	0005	0.051	
	15 25	0015	0.045	
	15 25	0025	0.048	
	15 25	0050	0.144	
	15 25	0076	0.211	
73/09/26	09 20	0000	0.040	12.6
	09 20	0005	0.039	
	09 20	0015	0.037	
	09 20	0025	0.053	
	09 20	0040	0.064	
	09 20	0055	0.247	
	09 20	0070	0.246	

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/01/30

5110A1
37 02 10.0 029 31 40.0
ROANOKE RIVER
51 7.5 SMITH MTN DA
0/SMITH MOUNTAIN LAKE
BRDG BELO SMITH MTN DAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/08/13	19 00		0.357	0.140	0.034	0.010	0.010
73/09/14	17 00		0.260	0.560	0.073	0.005K	0.015
73/10/19	17 00		0.120	0.850	0.115	0.014	0.015
73/11/09	16 30		0.176	0.300	0.052	0.005K	0.005K
73/12/14	16 15		0.264	0.200	0.008	0.005K	0.010
74/01/11	18 05		0.252	0.200	0.020	0.008	0.020
74/03/15	18 30		0.310	0.700	0.035	0.005K	0.015
74/04/12	09 00		0.260	0.400	0.010	0.010	0.025
74/05/03	19 15		0.340	0.400	0.020	0.005	0.005
74/05/17	18 05		0.310	0.100K	0.010	0.005K	0.005K
74/05/31	18 30		1.470	0.300	0.015	0.005	0.005
74/06/14	14 30		0.330	0.200	0.005	0.005K	0.005K

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/01/30

5110AX
37 02 10.0 029 31 40.0
ROANOKE RIVER
51 7.5 SMITH MTN DA
X/SMITH MOUNTAIN LAKE
BRDG BELO DAM PUMPAGE RETURN FLOWS
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	11 10		0.400	0.660	0.033	0.010	0.020
73/08/11	12 01		0.357	0.360	0.050	0.008	0.020
73/09/15	11 45		0.250	0.520	0.084	0.005K	0.020
73/10/20	11 00		0.110	0.750	0.105	0.011	0.011
73/11/10	17 00		0.189	0.400	0.051	0.005K	0.015
73/12/15	12 45		0.276	0.360	0.008	0.005K	0.015
74/01/12	13 20		0.288	0.700	0.032	0.008	0.020
74/02/16	13 30		0.384	0.600	0.025	0.005K	0.025
	14 15		0.368	0.800	0.030	0.005K	0.025
74/03/16	13 30		0.330	1.500	0.075	0.025	0.080
74/04/13	15 15		0.288	0.300	0.010	0.005	0.025
74/05/04	12 00		0.276	0.300	0.015	0.005K	0.015
74/05/18	07 30		0.312	0.100	0.010	0.005K	0.005K
74/06/01	16 30		0.450	0.200	0.010	0.007	0.007
74/06/15	12 30		0.310	0.200	0.005	0.005K	0.005

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/26

5110A2
37 15 16.0 079 52 15.0
ROANOKE RIVER
51 7.5 STEWARTSVILL
1/SMITH MOUNTAIN LAKE
BLUE RIDGE PARKWAY BRDG
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	14 50		0.820	1.680	0.710	0.320	0.415
73/08/11	10 20		0.460	1.800	0.730	0.089	0.200
73/09/15	11 45		0.580	2.700	1.890	0.399	0.480
73/10/20	12 45		0.520	3.700	1.470	0.267	0.360
73/11/11	10 00		0.430	3.150	1.560	0.260	0.840
73/12/15	11 20		0.720	2.600	0.140	0.032	0.065
74/01/12	11 05		0.660	1.000	0.312	0.028	0.100
74/02/16	12 15		0.610	1.500	0.175	0.020	0.300
74/03/16	13 15		0.460	1.400	0.250	0.030	0.075
74/04/12	08 45		0.910	0.300	0.210	0.050	0.055
74/05/04	12 10		0.450	1.200	0.740	0.085	0.145
74/05/18	11 20		0.450	1.300	0.750	0.370	0.490
74/06/01	11 00		0.460	2.300	0.660	0.165	0.270
74/06/15	12 00		0.176	0.100	0.005	0.060	0.065

STORET RETRIEVAL DATE 75/03/26

511081
37 03 20.0 079 45 35.0
BLACKWATER RIVER
51 7.5 REDWOOD
T/SMITH MOUNTAIN LAKE
RT 834 BRDG 2 MI S OF XROADS
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	10 30		0.420	0.170	0.015	0.025	0.060
73/08/11	11 05		0.660	0.390	0.030	0.030	0.140
73/09/15	11 05		0.460	0.810	0.084	0.038	0.230
73/10/20	10 30		0.176	0.200	0.028	0.035	0.035
73/11/10	14 50		0.160	0.150	0.028	0.016	0.030
73/12/15	11 50		0.504	0.100K	0.020	0.012	0.040
74/01/12	11 25		0.650	0.550	0.044	0.028	0.155
74/02/16	11 40		0.650	0.500	0.045	0.010	0.050
74/03/16	12 30		0.470	0.800	0.055	0.015	0.050
74/04/13	14 30		0.460	0.200	0.015	0.020	0.020
74/05/04	12 50		0.510	0.550	0.035	0.020	0.092
74/05/17	11 40		0.480	1.400	0.045	0.030	0.165
74/05/31	12 50		0.710	1.100	0.085	0.015	0.315
74/06/15	11 42		0.400	0.200	0.010	0.015	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/26

5110C1
37 06 00.0 079 44 00.0
GILLS CREEK
51 FRANKLIN CO HWY
T/SMITH MOUNTAIN LAKE
RT 834 BRDG 6 MI E OF BURNT CHIMNEY
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	10 00		0.430	0.560	0.031	0.036	0.310
73/08/11	10 35		0.378	0.285	0.028	0.032	0.132
73/09/15	10 30		0.350	0.890	0.068	0.052	0.280
73/10/20	09 30		0.154	0.450	0.029	0.029	0.095
73/11/10	14 40		0.120	0.250	0.022	0.018	0.030
73/12/15	11 45		0.336	0.200	0.032	0.012	0.035
74/01/12	10 30		0.420	0.800	0.036	0.040	0.125
74/02/16	11 30		0.420	1.000	0.035	0.010	0.050
74/03/16	12 10		0.264	0.800	0.035	0.015	0.100
74/04/13	14 05		0.288	0.250	0.010	0.020	0.105
74/05/04	12 00		0.208	0.100	0.027	0.015	0.065
74/05/18	17 30		0.352	0.300	0.030	0.025	0.115
74/05/31	17 40		0.440	0.500	0.045	0.025	0.140
74/06/15	11 00		0.336	0.300	0.015	0.020	0.090

STORET RETRIEVAL DATE 75/03/26

511001
37 13 40.0 079 52 07.0
BACK CREEK
51 7.5 HARDY
T/SMITH MOUNTAIN LAKE
RT 660 BRDG 2 MI SE OF DUNDEE
11EPALES 2111204 *
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEE	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	13 55		0.320	0.260	0.016	0.050	0.130
73/08/11	10 00		0.189	0.440	0.019	0.058	0.115
73/09/15	10 00		0.280	0.370	0.039	0.050	0.165
73/10/20	09 00		0.037	0.900	0.061	0.062	0.080
73/11/10	13 15		0.010K	0.300	0.014	0.087	0.115
73/12/15	11 05		0.460	0.100K	0.010	0.078	0.100
74/01/12	10 00		0.560	0.400	0.036	0.056	0.140
74/02/16	10 30		0.504	0.800	0.035	0.035	0.063
74/03/16	11 20		0.252	0.900	0.027	0.035	0.075
74/04/13	13 35		0.320	0.300	0.010	0.050	0.070
74/05/04	13 50		0.192	0.300	0.030	0.075	0.110
74/05/17	16 50		0.270	0.200	0.030	0.075	0.160
74/05/31	16 50		0.360	0.400	0.030	0.065	0.135
74/06/15	10 25		0.232	0.600	0.020	0.070	0.130

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/26

5110E1
37 48 20.0 079 14 44.0
FALLING CREEK
51 7.5 HARDY
T/SMITH MOUNTAIN LAKE
RD BRDG 2 MI S OF STEWARTSVILLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	15 30		0.231	0.400	0.032	0.025	0.070
73/08/11	10 55		0.350	0.380	0.273	0.021	0.060
73/09/15	12 15		0.231	0.490	0.064	0.061	0.111
73/10/20	11 45		0.082	0.900	0.056	0.028	0.060
73/11/11	10 30		0.220	0.250	0.018	0.016	0.025
73/12/15	11 40		0.240	0.200	0.020	0.020	0.050
74/01/12	11 21		0.460	0.600	0.032	0.036	0.075
74/02/16	12 45		0.440	1.600	0.040	0.015	0.045
74/03/16	12 10		0.288	1.500	0.020	0.015	0.070
74/04/13	09 20		0.088	0.200	0.010	0.040	0.055
74/05/04	11 45		0.148	0.800	0.060	0.025	0.055
74/05/18	11 40		0.320	0.400	0.030	0.025	0.155
74/06/01	11 30		0.390	0.400	0.030	0.025	0.145
74/06/15	13 45		0.500	0.400	0.035	0.020	0.070

STORET RETRIEVAL DATE 75/03/26

5110F1
37 13 30.0 079 45 02.0
BEAVERDAM CREEK
51 7.5 HARDY
T/SMITH MOUNTAIN LAKE
BRDG JUST OFF RT 757 2 MI W OF GOODVIEW
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	16 00		0.336	0.612	0.031	0.024	0.095
73/08/11	11 15		0.410	0.460	0.058	0.025	0.080
73/09/15	12 45		0.294	0.720	0.046	0.025	0.100
73/10/20	11 10		0.168	0.200	0.026	0.019	0.060
73/11/11	10 45		0.130	0.750	0.024	0.016	0.030
73/12/15	12 10		0.410	1.300	0.076	0.016	0.040
74/01/12	11 40		0.400	0.600	0.032	0.016	0.055
74/02/16	13 05		0.430	1.100	0.035	0.005	0.040
74/03/16	11 50		0.300	0.900	0.025	0.010	0.050
74/04/13	09 35		0.184	0.300	0.015	0.020	0.020
74/05/04	13 10		0.076	0.400	0.035	0.015	0.045
74/05/18	12 20		0.330	0.450	0.055	0.030	0.230
74/06/01	11 50		0.360	0.400	0.040	0.015	0.195
74/06/15	12 45		0.040	1.600	0.020	0.100	0.350

STORET RETRIEVAL DATE 75/03/26

511061
37 13 30.0 079 44 55.0
KATES CREEK
51 7.5 GOODVIEW
T/SMITH MOUNTAIN LAKE
RT 757 BRDG 1.5 MI W OF GOODVIEW
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/07/15	16 20		0.399	0.290	0.024	0.013	0.045
73/08/11	11 20		0.490	0.340	0.028	0.014	0.045
73/09/15	12 50		0.252	0.280	0.029	0.021	0.060
73/10/20	11 00		0.315	0.500	0.046	0.010	0.010
73/11/11	10 52		0.260	0.500	0.031	0.010	0.025
73/12/15	12 15		0.370	0.400	0.028	0.008	0.025
74/01/12	11 50		0.400	0.200	0.020	0.012	0.030
74/02/16	13 10		0.450	1.200	0.030	0.005K	0.030
74/03/16	13 35		0.300	0.100	0.025	0.005	0.035
74/04/13	10 10		0.160	0.500	0.010	0.010	0.010
74/05/04	13 08		0.224	0.500	0.040	0.005	0.030
74/05/18	12 25		0.259	0.500	0.042	0.015	0.060
74/06/01	11 58		0.360	0.200	0.040	0.010	0.035
74/06/15	14 44		0.072	0.100K	0.015	0.055	0.065

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/26

5110AA AS5110AA P098000
37 15 55.0 079 54 55.0
CITY OF ROANOKE
51153 7.5 ROANOKE
T/SMITH MTN RESERVOIR
ROANOKE RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/11/27	08 00		0.320	13.500	1.260	1.300	2.500	22.600	21.000
CP(T)- 73/11/28	08 00								
73/12/27	07 00		0.480	6.200	0.480	0.140	0.340	36.300	26.700
CP(T)- 73/12/28	06 00								
74/01/31	08 00		0.280	8.300	0.540	3.900	4.900	30.200	30.200
CP(T)- 74/02/01	07 00								
74/02/26	08 00		0.240	10.000	0.160	0.360	0.950	27.800	28.100
CP(T)- 74/02/27	08 00								
74/03/28	08 00		0.120	6.600	1.150	0.750	1.650	25.000	25.000
CP(T)- 74/03/29	07 00								
74/04/30	08 00		0.080	21.000	3.850	2.900	6.200	24.100	25.400
CP(T)- 74/05/01	07 00								
74/05/29	08 00		0.440	20.000	7.500	1.050	2.800	23.900	23.000
CP(T)- 74/05/30	07 00								
74/06/27	00 00		0.200	14.000	3.150	3.200	4.300	21.600	21.800
CP(T)- 74/06/27	24 00								
74/07/31	09 00		0.840	14.000	1.150	0.410	0.920	21.600	21.200
CP(T)- 74/07/31	20 00								
74/08/29	08 00		1.120	12.000	2.800	0.700	1.000	21.300	21.500
CP(T)- 74/08/30	07 00								
74/09/26	00 00		2.400	6.700	0.360	0.990	1.100	20.200	21.900
CP(T)- 74/09/27	24 00								
74/10/30	08 00		0.800	27.000	11.500	1.050	1.600	19.600	19.200
CP(T)- 74/10/31	07 00								

STORET RETRIEVAL DATE 75/03/26

5110AA ASS110AA P098000
37 15 55.0 079 54 55.0
CITY OF ROANOKE
51153 7.5 ROANOKE
T/SMITH MTN RESERVOIR
ROANOKE RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/11/26 CP(T)- 74/11/27	08 00 07 00		1.440	13.000	3.000	0.920	1.250	19.500	18.100

STORET RETRIEVAL DATE 76/02/09

51110DA PD51110DA P001800
37 11 46.0 080 00 05.0
ROANOKE SAN. CORP STARTER PLANT
51 7.5 BENT MIN
T/SMITH MTN RESERVOIR
BACK CREEK/ROANOKE RIVER
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/04/24	08 00		0.320	7.000	0.350	9.100	11.000	0.277	0.355
74/05/22	08 00		0.160	8.500	0.210	9.800	13.500	0.257	0.308
74/06/27	08 00		0.128	8.750	0.120	10.500	13.000	0.192	0.276
74/07/28	10 00		2.080	6.200	0.220	12.500	13.500	0.182	0.201
74/08/28	08 00		0.040	11.000	0.050		7.350	0.282	0.350
74/10/30	08 00		1.040	4.900	0.250	7.600	7.700	0.283	0.261
75/01/15	08 00		0.080	9.700	0.170	8.900	9.300	0.324	0.266
75/02/26	08 00		0.080	9.400	0.080K	7.200	7.450	0.282	0.447
75/04/26	10 00		0.050	12.500	0.520	7.450	8.200	0.428	0.560
75/05/23	08 00		0.100	23.000		9.400	10.000	0.287	0.364

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/26

5110KA TF5110KA P000140
37 28 00.0 079 55 00.0
LORD BOTETOURT HI SCH. FINCASTLE
51 7.5 BOTETOURT CO
T/SMITH MTN RES
UNNAMED TRIB/TINKER CREEK
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/02/11	10 00		25.200	1.000K	0.064	6.300	6.300		
74/03/12	10 30		0.840	1.000K	0.050K		5.800		
74/04/12	08 30		0.720	1.000K	0.050K	0.070	0.110		
74/05/11	08 30		3.120	1.000K	0.050K	0.530	0.530		
74/06/11	07 30		34.000	1.000K	0.050K	5.450	5.500		
74/09/04	08 00		0.140	0.500K	0.025K	0.025	0.058		
74/10/07	09 00		0.120	7.400	0.050K	0.170	6.800		
74/11/11	11 30		4.560	1.000K	0.050K	0.780	0.810		
74/12/12	10 00		1.120	1.000K	0.050K	0.211	0.250		
75/01/14	11 30		6.100	1.700	0.050K	0.050K	1.400		

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/03/26

5110YA IF5110YA P010000
37 16 12.0 079 54 15.0
VINTON
51 7.5 ROANOKE
T/SMITH MTN RESERVOIR
TINKER RUN
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/01/16	09 00		5.400		29.400			0.809	0.823
74/02/20			1.520	14.000	2.900	6.300	8.400	0.935	0.921
74/03/22	08 30		2.000	6.800	0.850	4.400	5.600	0.785	0.810
74/04/22	10 00		1.000	16.000	8.800	5.300	7.700	0.700	0.725
74/05/13	10 00		1.920	14.000	3.700	4.000	5.750	0.721	0.702
74/06/18			3.120	13.000	4.600	6.400	8.900	0.825	0.727
74/07/15	09 00			31.000	0.200	7.100	8.800	0.650	0.711
74/08/14	10 00		3.000	22.000	8.100	6.900	10.000	0.850	0.720
74/09/13	08 30		5.200	4.000	1.250	5.500	6.670	0.905	0.840
74/10/15	10 00		3.680	15.000	3.000	6.600	9.300	0.800	0.785
74/11/14	08 00		3.200	16.000	3.900	7.400	9.600	0.800	0.820
74/12/10	10 00		4.480	10.000	0.340	3.900	5.900	0.887	0.828
75/01/14	08 15		2.800	8.800	1.080	3.430	4.400	0.942	0.870

STORET RETRIEVAL DATE 75/03/26

5110ZA TF5110ZA P000140
37 16 45.0 079 53 30.0
ROANOKE NURSING HOME
51 7.5 ROANOKE
T/SMITH MTN RESERVOIR
UNNAMED STR/GLADE CR/TINKER CR/ROANOKE R
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/11/30	11	00							
CP(T)-			5.500	23.000	3.700	6.900	10.500	0.004	0.003
73/11/30	16	00							
73/12/28	11	00							
CP(T)-			5.040	10.000	0.830	6.400	6.600	0.004	0.007
73/12/28	16	00							
74/01/31	11	00							
CP(T)-			6.200	13.000	3.400	6.100	8.600	0.004	0.005
74/01/31	16	00							
74/02/26	11	00							
CP(T)-			5.800	19.000	1.650	7.800	10.500	0.005	0.005
74/02/26	16	00							
74/03/28	11	00							
CP(T)-			8.500	7.700	2.300	6.800	10.000	0.003	0.005
74/03/28	16	00							
74/04/30	11	00							
CP(T)-			9.500	40.000	5.750	8.500	10.500	0.003	0.005
74/04/30	16	00							
74/05/29	11	00							
CP(T)-			6.000	25.000	9.700	10.000	18.000	0.006	0.005
74/05/29	16	00							
74/06/27	11	00							
CP(T)-			7.400	17.000	3.900	4.300	10.000		0.005
74/06/27	16	00							
74/07/31	10	00							
CP(T)-			8.200	29.000	7.000	9.300	12.250		0.004
74/07/31	16	00							
74/08/29	10	00							
CP(T)-			5.700	20.000	7.100	7.600	12.500	0.004	0.005
74/08/29	16	00							
74/09/27	10	00							
CP(T)-			10.500	18.000	2.200	9.500	12.000	0.004	0.005
74/09/27	16	00							
74/10/31	10	00	8.400	24.000	6.300	9.500	9.500	0.004	0.005
74/11/27	10	00	5.280	20.000	18.000	9.800	10.710		0.005